ATA Command Extension Proposal
for Media Card Pass Through Command

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To: Technical Committee T13
From: Toshiba, SanDisk and MEI
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Introduction:

Recently, the small-format flash memory cards, such as the Secure Digital (SD) Card, the Multi-media Card (MMC), and the Sony Memory Stick, have achieved wide consumer acceptance. These devices are primarily designed for consumer electronic devices such as digital cameras and flash-memory music players. However, it is desirable that they also have convenient connections to personal computers for uploading and downloading data.

The different cards have different electrical interfaces. This proposal defines commands that a hardware adapter could use to adapt these cards to an ATA-style interface. All cards have unique functions such as special I/O and security that are useful to expose to the PC host. To keep the adapter simple and inexpensive, the philosophy is to simply encapsulate the underlying card commands within a few ATA commands.

The founders of the SD Card association, MEI, Toshiba, and SanDisk are putting this proposal forward. Nonetheless, it is intended to be generic for all small-format cards, not just SD Cards.

Proposed Changes

The follows additions/modification are proposed for the ATA/ATAPI-67 standard based on the ATA/ATAPI-67 rev.1a0 draft standard:

X. x Media Card Pass Through Command feature set:

The **Media Card Pass Through Command** feature set uses the reserved commands "D1", "D2", "D3" and "D4", in addition to words 83 and 86 of the IDENTIFY DEVICE response. The commands "D2"-"D4" are reserved for the **Media Card Pass Through Command** feature set if this feature set is enabled by the command "D1". If the feature set is disabled, the commands "D2"-"D4" will be interpreted differently. The detailed information is described in the "D1" command of this proposal. This feature set embeds a small-format flash memory card commands inside the ATA commands. The adapter's firmware passes the embedded memory card's command to the memory card as is from the ATA command. The **PASS THROUGH** feature reduces the number of commands required for this feature set regardless of the number or type of memory card commands. It also reduces the adapter's firmware overhead in processing them. As new memory cards types are defined in the market, they can all be supported within this one feature.

The **Media Card Pass Through Command feature set** has total of 4 commands.

Check Media Card Type (Command Code D1h)
D2h – D4h are reserved for Media Card Pass Through Command feature set

The **Check Media Card Type command** returns the supporting status of the device to this feature set. It also enables and disables the device from running the Media Card Pass Through command mode. When the Media Card Pass Through command mode is disabled, the command codes D2-D4 will not be interpreted as Media Card Pass Through commands.

The definitions of the commands D2h-D4h are media card type dependent. The following table lists the Media card type and its associated reference document:

Media Card Type	Reference Document
SD Card	SD Card ATA Command Extension (SDA 3C)
Smart Media	Smart Media ATA Command Extension (SSFDC Forum)

In clause 8

8.12 IDENTIFY DEVICE

Table - - IDENTIFY DEVICE information *(Words ~~50,~~ 83 and 86)*

Word	R	F/V	
83	M	F	9: 1 = Media Card Pass Through command supported
86	M	V	9: 1 = Media Card Pass Through command enabled

F = The content of the word is fixed and does not change. For removable media devices, these values may change when media is removed or changed.

V = The contents of the word is variable and may change depending on the state of the device or the commands executed by the device.

8.x MEDIA CARD PASS THROUGH COMMAND Feature Set

8.x.1 CHECK MEDIA CARD TYPE command

8.x.1.1 Command code

D1h

8.x.1.2 Feature set

- Mandatory when the Media Card Pass Through Command feature set is implemented

8.x.1.3 Protocol

Non-data command

8.x.1.4 Inputs

Register	7	6	5	4	3	2	1	0
Feature	Na							ENB
Sector Count	Na							
Sector Number	Na							
Cylinder Low	Na							
Cylinder High	Na							
Device/Head	obs	na	obs	DEV	na			
Command	1	0	1	1	0	0	0	1

Feature register –

~~ENB = 1 to enable the Media Card Pass Through mode; = 0 to disable it.~~

ENB = 1 to enable the Media Card Pass Through mode; = 0 to disable it.

Note: After the power on state (Hard Reset) or Software Reset , this Value of Bit 9 Word 86 of IDENTIFY DEVICE data is set to "0" as an initial Value. To enable the Media Card Pass Through mode, this command must be sent with ENB bit setting to 1.

Device/Head register –

DEV shall indicate the selected device

8.x.1.5 Normal Outputs

For **Media Card adapter supporting the pass through command**, the status register outputs are describes as below. In addition, the device should return 55H in Sector Count Register and AAH in Sector Number register. The Device/Head register should remain the same as input for the selected device. If the adapter supports the Media Card Pass Through feature set and the ENB bit of the feature register input is set to 1, it must process any further Media Card Pass Through commands from now on. If the ENB bit is set to 0, the adapter must not interpret the command codes D2-D4 as the Media Card Pass Through commands. If the adapter does not support Media Card Pass Through Command set, or the host has disabled the Media Card Pass Through mode by setting ENB to 0, the host shall not send any further Media Card Pass Through command to the adapter.

Register	7	6	5	4	3	2	1	0
Error	0	0	0	0	0	0	0	0
Sector Count	0	1	0	1	0	1	0	1
Sector Number	1	0	1	0	1	0	1	0
Cylinder Low	d0							
Cylinder High	d1							
Device/Head	obs	na	obs	DEV	WP	Media Type		
Status	BSY	DRDY	DF	1	DRQ	0	0	ERR

Status register – 50H

BSY shall be cleared to zero indicating command completion.

DRDY shall be set to one.

DF (Device Fault) shall be cleared to zero.

DRQ shall be cleared to zero.

ERR shall be cleared to zero.

Device/Head register –

DEV shall indicate the selected device

WP   1: Write Protect,   0:   No Write Protect

Media Type   001:   SD Memory Card

010:    MMC

011:    SD IO Card

000, 100~111: Reserved

Cylinder High register – card-specific data d1

Cylinder Low register – card-specific data d0

Sector Number register - AAH

Sector Count register – 55H

8.x.1.6 Error Outputs

If there is an error in processing this command, the device shall set Error Bit in the Status register and set ABRT bit in the Error register.

Register	7	6	5	4	3	2	1	0
Error	0	0	0	0	0	ABRT	0	0
Sector Count	na							
Sector Number	na							
Cylinder Low	na							
Cylinder High	na							
Device/Head	obs	na	obs	DEV	na			
Status	BSY	DRDY	DF	na	DRQ	na	na	ERR

Device/Head register –

   DEV shall indicate the selected device

Status register:ERR (B0) shall be set to 1 to indicate error occurred

   BSY shall be cleared to zero indicating command completion.

   DRDY shall be set to one.

   DF (Device Fault) shall be set to one if a device fault has occurred.

   DRQ shall be cleared to zero.

   ERR shall be set to one if an Error register bit is set to one.

Error register: ABRT (B2) shall be set to 1 to indicate command aborted

8.x.1.7 Description

This **CHECK MEDIA CARD TYPE** command allows the host to determine the device's capability of supporting the **~~ATA~~ Media Card Pass Through Command** feature set. The Identify Drive Data bit 9 of Word 86 should be set to 1 upon the successful completion of this command.